Case Study No. 2 Waterborne and UV-Cured Coatings
Artistic Finishes, Inc.
Roseville, MN

Background

Artistic Finishes is a contract custom finishing company. Products finished include furniture, cabinets, windows, doors, picture frames, hardwood flooring, molding, and exercise equipment. Many of their jobs are finished with low-VOC/HAP coatings. The company has made a commitment to use environmentally friendly finishing methods, and has engaged in various research and development projects to find high-performing, low-emitting finishes to replace solvent-borne finishes. Artistic's customers typically specify the coatings they want them to use on particular products, so many of these research projects were conducted to develop alternatives to solvent-borne coatings their customers wanted them to use. Since the specific manufacturing and coating processes vary by product, this case study will discuss projects Artistic has undertaken to switch various product lines to low-VOC/HAP coatings.

Conversion to Waterborne Coating for Interior Window and Door Components

Artistic has been finishing this particular product line since 1989. Artistic's customer wanted them to use a catalyzed, solvent-borne polyurethane coating that was very toxic. The VOC content of the coating was about 5.8 pounds per gallon and the catalyst was isocyanate-based. In 1992, Artistic decided to bring in a new coating supplier to develop a non-toxic, low- or no-VOC coating of equal performance. The research and development process for the coating took about one year, and the coating supplier was able to produce a high-solids, waterborne, single pack urethane that contained only 1 pound per gallon of VOC and 45 percent solids. Artistic has been using that coating since 1993.

Capital costs for process changes and the new equipment required to apply that coating were about $300,000, and costs involved with labor, planning, and research are estimated at about $100,000. However, the coating cost was cut in half, since the catalyst for the old coating was very expensive. The equipment maintenance required also decreased, and mixing equipment was no longer necessary with the single pack system.

Cleaning emissions also were reduced. Previously, the lines were cleaned several times per day with methyl ethyl ketone, due to color changes or clogged lines. With the new coating, operators flush the lines with water only during color changes.

Conversion to UV-Curable Coatings for Exercise Equipment Components and Other Products

Artistic was contracted to finish a line of exercise equipment components until 1996 (at which time the product line changed). When they began finishing this line, they used a solvent-borne stain, a catalyzed sealer, and a catalyzed topcoat or conversion varnish. Three coats were applied to the components, which had to be racked overnight to dry. In 1994, Artistic began to investigate alternative coating systems for this line, including waterborne and UV-curable coatings. They initially switched to UV-curable coatings that had only 60 percent solids, but then transitioned to 100 percent solids UV-curable stains and topcoats. Artistic estimates that the time to convert to the UV-cured product was only 60 to 90 days, and they were able to increase their production rate to five times that of the solvent-borne system because the coatings cure within seconds and are applied on an automated flat line.

The transition to UV-curable coatings for the exercise equipment components allowed Artistic to bring in other business, namely hardwood floors and transitional moldings. They currently use waterborne stains and 100 percent solids UV-curable sealers and topcoats on hardwood flooring, molding, and paneling. They found that the waterborne stains provided better color consistency and color matching than the UV-curable stains. Drawer components also are finished with UV-curable acrylic urethanes.

Artistic also uses a 100 percent solids, sprayable, UV-cured coating. They use an automated spray system to apply this coating to profiled parts, such as molding. Since the UV-curable coatings cost $60 to $80 per gallon, Artistic wanted to find a way to capture and reuse the overspray from this system. Therefore, they developed an overspray reclamation system customized to their line. The implementation of the sprayable UV-cured topcoat and overspray reclamation system also resulted in a reduction in the amount of cleaning solvent used, since they flush this line less often than they would a solvent-borne spray system.

Facility personnel stated that it took time for the operators to orient themselves to the new coatings. Employees have to wear protective equipment when working with the UV-curable coatings, and they had to learn new safety and housekeeping procedures. A labor savings was experienced with the switch to UV-curable coatings, since the line is automated and no operators are required to rack parts for drying. Space also was saved, since the drying racks are no longer required.

Emissions

Artistic's operating permit allows them 100 tons per year of VOC emissions. According to Artistic, they currently are operating at 12 to 14 tons of VOCs per year, and have been able to decrease their emissions over the past several years as production has increased and the types of products coated have varied. Their high permit limit provides them with a lot of flexibility and a high production capacity.

Summary
From 1985 to 1992, Artistic mostly used solvent-based coatings. Then, they began to investigate alternative coating technologies. Today, 90 percent of their finishing is done with waterborne or UV-curable coatings. They will work with their customers to find low-emitting coatings of equal or better quality than traditional solvent-borne coatings, and have refused jobs when customers insisted on having their products finished with traditional solvent-borne lacquers.

Artistic is very satisfied with the quality of the waterborne and UV-cured finishes. Because the UV coatings cure in seconds, problems with dry time (e.g., finished pieces sticking together) have been eliminated. Artistic has had no negative feedback from their customers on products finished with the low-VOC/HAP coatings. They feel that being a contract finishing facility saves their customers the cost of complying with regulations, while providing skilled workers and extensive finishing knowledge.